THURSDAY, AUGUST 29, 1912.

AN INTRODUCTION TO ARISTOTELIAN SCIENCE.

Aristotle's Researches in Natural Science. By Dr. T. E. Lones. Pp. viii + 274. (London: West, Newman and Co., 1912.) Price 6*s.* net.

THIS is a very interesting book, and we commend it heartily to the readers of NATURE. Even had we at hand, what we have not as yet, a series of translations of all Aristotle's works on natural and physical science, it would be no easy task for the student to lay hold of the great mass of scattered facts therein contained, to deal with the many repetitions and the not infrequent contradictions, and to set in order in his mind the range of ancient science as represented by Aristotle. This is the task that Dr. Lones has undertaken, and he has brought to bear upon it a great deal of learning and much patience and editorial skill.

After some introductory chapters on Aristotle's general method and on the consecutive order of his books, Dr. Lones proceeds to deal with Aristotle's conception of the Cosmos, and with his account of celestial, atmospheric, and terrestrial phenomena. This account is based chiefly upon the "Meteorology," a book of very great interest, of which we have an old but admirable edition from the hands of that learned astronomer Ideler. From Dr. Lones's brief epitome, we may learn much of Aristotle's curious knowledge regarding such subjects as the rainbow, and comets, and mock suns, and periodic winds, and earthquakes and volcanoes, and all the varied lore of ancient physical geography. The somewhat obscure treatise commonly called the "Physics" is next treated, and here we are introduced to Aristotle's conception of *phlogistic,* and to the various phenomena of heat and sound, of light and colour.

The rest, and the greater portion, of the book deals with the inexhaustible subject of Aristotle's "Natural History." We begin with a discussion of life itself, of that "vital principle," or ψυχή, with which philosophers more ancient than Aristotle had dealt, and the varying aspects of which in plants, animals, and man Aristotle describes with admirable insight and brevity. And so through the study of tissues and organs and the functions of organs, through the physiology of locomotion and generation and of development, the book leads us easily and clearly on to an account of Aristotle's classification of animals, and to his descriptions of the structure and habits of all manner of invertebrates and vertebrates, or, as he called them, creatures lacking or provided with blood.

Let us glance for a moment at one chapter only, that in which Dr. Lones deals with the fishes of Aristotle. Here, beginning with the Selachia or cartilaginous fishes, we hear what Aristotle has to tell us about skates and sharks of various kinds, and how he confused, on account of its cartilaginous skeleton, the Batrachos, or fishing-frog, with these Selachians, or, as we now call them, the Elasmobranch fishes. We find an account of the torpedo and its numbing power, of the angel-fish with its rough skin and viviparous habit, of the sting-ray and its spiny tail, and of the smooth dog-fish and the placental nourishment of its viviparous young, which Johannes Müller redescribed in a classical memoir. Passing to the bony fishes, we read what Aristotle has to say of the Scarus, or parrot-fish, with its great teeth, and browsing or so-called ruminating habits; of the breeding habits and curious spawn of the perch; of the pipe-fish, and how its eggs are carried in the brood-pouch of the male; of the hermaphrodite Serranoid fishes; of the "Glanis" or Silurus, from which account Gesner conjectured, and Agassiz proved, that Aristotle was acquainted with a second species of that genus, inhabiting the rivers of Greece, and unknown to later naturalists until Agassiz rediscovered it.

In one point only in this interesting chapter does Dr. Lones seem to me to have fallen into error, and the point interests me the more because I fell into the same error myself. Aristotle mentions a certain nest-building fish under the name of *Phycis*—the only sea-fish, "so they say," that makes a nest and rears its young therein. Blindly following Cuvier and Olivi and other writers, I identified this fish as one of the gobies, when I was writing my translation of Aristotle's "Natural History." My book was scarcely out when, in a learned paper on the fishes of Ovid, a German scholar adopted the same identification, and Dr. Lones does the same thing now. But we are all of us wrong, as that most learned ichthyologist, Dr. Theodore Gill, soon pointed out to me. The nest-building fishes which Aristotle speaks of are undoubtedly wrasses. The breeding habits of some of these are still unknown to naturalists, though they may perhaps be well known to Mediterranean fishermen; but in some cases, as in the little Ctenilabrus, the nest, as described by M. Gerbe, is now familiarly known, and its whole story tallies with Aristotle's description. One day last summer, on the pier at Yarmouth in the Isle of Wight, I met a fisherman who had just caught some of these little wrasses to use for bait, and I found that the whole story of their nesting habits was familiar to him.

The identification of Phycis, by the way, is

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notably helped by a fragment of Speusippus, Plato's pupil and successor. This philosopher wrote a treatise περὶ ῾Ομοίων, which most scholars, I fancy, take to have been a discussion of broad likenesses and unlikenesses, in other words, an account of the principles of the classification of animals. From the few fragments that remain, I believe, on the other hand, that the book simply dealt with isolated cases of unexplained resemblance between creatures obviously and essentially different; it was, in fact, a foreshadowing of our discussions on mimetism. In it Speusippus mentions that the Phycis resembled Perca and Channa, and these we know to have been Serranoid fish, probably *S. scriba* and *S. cabrilla.* The statement is not inappropriate to the wrasse, but is altogether inapplicable to the goby.

After this parenthesis, we must now take leave of Dr. Lones's book. In bringing what Aristotle has written into something of the shape and order of a modern text-book and into modern verbiage, we cannot but lose much of the charm of the original, the archaic method of description and the personal element of Aristotle's style; but, on the other hand, we have a practical gain. If we want an easy and a pleasant glimpse into Aristotelian science, we have it here; and the compilation has been done with due care and adequate learning, and in the earnest spirit of a scholar.

D'ARCY W. THOMPSON.

RECENT BOTANICAL PUBLICATIONS.

(1) *A Textbook of Botany for Colleges and Universities.* By Members of the Botanical Staff of the University of Chicago—Drs. J. M. Coulter, C. R. Barnes, and H. C. Cowles. Vol. ii., "Ecology." Pp. x+485–964+*a–q*. (New York: American Book Co., n.d.)

(2) *Sub-alpine Plants:* or Flowers of the Swiss Woods and Meadows. By H. Stuart Thompson. Pp. xv+325, and 33 coloured plates. (London: George Routledge and Sons, Ltd.; New York: E. P. Dutton and Co., 1912.) Price 7*s*. 6*d*. net.

(3) *Botany:* Chapters on the Study of Plants. By G. S. Boulger. Pp. viii+119; illustrated. (Halifax: Milner and Co., n.d.) Price 1*s*. net. (Twentieth Century Science Series.)

(4) *Allgemeine Botanik.* By Prof. A. Nathansohn. Pp. viii+471. (Leipzig: Quelle and Meyer, 1912.) Price 10 marks.

(1) THE second volume of the Chicago textbook of botany, which deals with ecology, is a very clear exposition of plant-structures in relation to their environment. It is a wide subject of which to treat, and one is immediately struck with the way in which the authors have managed to deal with it in the comparatively limited space of 480 pages, including numerous illustrations. That this treatment has been eminently successful is due to a directness of expression combined with a simplicity of presentation. The chapters are concise but lucid, and the arrangement of the subject-matter is very good.

The general physiological ideas of the authors are placed before the student very clearly. The conception of the green plant as a manufacturer of its own *food* from raw materials is maintained in this volume as in vol. i., and the important point of view that this manufacture must not be confused with "assimilation" is one with which most biologists will have much sympathy. It leads at once to the same general conception of assimilation in all living organisms, and emphasises the fact that whereas both plants and animals are *consumers* of organic substances, only plants are *producers* of that organic substance from raw materials. As a general principle it is an excellent conception of nutrition which is applicable to all living organisms, and the authors are to be congratulated on the boldness with which it is set forth.

Emphasis is again laid upon the view that transpiration, if not a necessary evil, is "the greatest danger to which plants are exposed, and the harm that it entails certainly far exceeds any incidental good." Careful consideration cannot but admit the logic of this view, which is so different from what is usually taught in this country and from what is set forth in the "Bonn Textbook."

The statements (on p. 593) that "Batrachospermum, when grown in weak light, develops only the embryonic or juvenile stage, known as the separate genus Chantransia," and that in Stichococcus "high concentration induces the development of filaments of elongated cells, once referred to the genus Rhaphidium," are rather misleading in the light of modern knowledge of the algæ concerned.

In the section of chapter v. dealing with "reproductive behaviour in the seedless plants" pp. 803–824), mention might with advantage have been made of the evolutionary series of the Volvocaceæ.

The issue of the second volume of this work completes much the most important botanical textbook of recent years. It is a work of an exceedingly high order of merit, and can be recommended without the slightest hesitation to all English-speaking students of botany.

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